Analysing learners' literacy and numeracy (LN) progress at Waikato Institute of Technology (Wintec) for the period 2012-2014

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EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 **Burgeoning literacy and numeracy assessment tool (LNAT) data:** The LNAT has allowed the tertiary sector to amass significant LN assessment data since 2010.

1.2 **National and local LN trends and profiles:** Ministry of Education reports (Lane, 2012, 2014) serve as points of orientation, providing the sector with national findings for target populations' LN performance, while tertiary providers manage and analyse LN data at local level.

1.3 **LNAT data-extraction file layout as a barrier**: LNAT data-extraction file layout, we concluded, was a significant barrier in managing and tracking learners' LN performance at tertiary provider level.

1.4 **Main aim of this project**: The main aim was to explore ways of managing and analyzing LNAT assessment data generated at the institute, developing processes to track, analyse and interpret learners' LN performance, with specific reference to Māori, Pasifika, New Zealand Pākeha and other ethnicities.

2. *RESEARCH QUESTIONS*

2.1 In **tracking the LN performance** of Māori, Pasifika, New Zealand Pākeha and Other ethnicities at the institute,

- what impact did the current LNAT data-extraction file layout have on institute-level data -management and processing?
- how could the format of the LNAT data-extraction file be changed into a multivariate layout?
- how could a time factor be introduced into LN progress calculations?
- how were initial LN scores and biographical variables in the LNAT data-extraction file associated with module completions in the institute's Student Data Return (SDR) files?

3. *RESEARCH METHODOLOGY*

3.1 **Quantitative methods:** The Statistical Package for the Social Sciences (SPSS) (V22) was used to compute

- cross-tabulations and bar charts for categorical variables (i.e. step level, gender, ethnicity and English as a First language), and where relevant, means and standard deviations for continuous variables.
- the level of association between these categorical variables and module completions.
- a regression analysis, selecting the categorical variables and scale score, to predict membership of the Pass/Fail categories of module completions in the reading and numeracy data sets.

3.2 **Replicating TEC gain calculations.** Excel was used to replicate the TEC (2012) gain calculations, and then experiment with a time factor, expressed as a proportion of gain to be achieved, in three scenarios for calculating gain.

3.3 **Wintec data sets**: We collated six core sets: (1) ***LNAT use (2011-2014)***: Reading (n=15854) & numeracy (n=15218); (2) ***Matched pre/post learner scores (2012-2014)***: Reading (n=1998) & numeracy (n=2159); and (3) ***SDR data and LN scores:*** Reading (n=1000) & numeracy (n=1000).

4. FINDINGS & DISCUSSION

4.1 **Data file layout and LN results for Māori, Pasifika, New Zealand Pākeha and Other ethnicities.**

- We found that the LNAT data-extraction file layout was a significant barrier.
- The current LNAT data layout extracted all assessment scores into one column in the csv file. This meant that a multivariate data layout (with initial and next best score listed in separate columns) for a repeated measures analysis was unavailable. Thus, resource-intensive manual data restructuring and data coding were needed.
- Inconsistent assessment naming conventions for LN results from other institutes labelled as "Reading Assessment" or "Numeracy assessment".
- We illustrate in four sub-reports

- how we manually coded data in the merged assessment score column to enable us to restructure the data outputs so that cross-tabulations and bar charts could be computed.
- the value of a multivariate layout (Field, 2005; Tredoux, 2002) which allows for regression analyses.
- how the sector could more easily process LNAT data if the data-extraction layout was altered within the LNAT (at the origin of the data in the LNAT rather than the user-end).
- the LN status of the four ethnicities, showing that Pasifika and Māori learners were more vulnerable than their New Zealand Pākeha and Other Ethnicity counterparts.
- that the strategic priorities in the Tertiary Education Strategy (2014-2019) (MoE, 2014), and the TEC's concerted effort to improve outcomes for Māori and Pasifika (TEC 2013, TEC 2014), as well as positions adopted in the TEC's LN implementation strategy (TEC, 2015), were justified.

4.2 **Time lapse between initial and progress assessments should be accommodated.**

- We showed that the time factor, if introduced into gain calculations, generated a far more positive account of learners' LN gains than the current algorithm.
- Reder's (2012) finding that significant gain occurred over a 5- to 6-year period was adopted as base period.
- The time lapse variable was expressed as a proportion (time between assessments = [numerator] and, say, a 5-year base period = [denominator]).
- Although deemed a contestable form statistical extrapolation, we continue to view *time lapse* as important, yetunaccounted for in the current LNAT gain calculation algorithm (TEC, 2012).

4.3 **Merging LNAT and SDR data - LN performance and module completions.**

- We found a link between categorical variables (gender, ethnicity, English as a first language and LN steps) and module completions; however, performing these analyses led to time-consuming data processing.
- Anecdotally, we view variables other than LN as impacting on learners' module completions (i.e. socio-economic status, significant life events, social ills, mental illness, resilience and self-efficacy, to name a few).
- We found a significant link between initial LNAT step scores and module completions.
- Our analyses also showed that gender, ethnicity, English as a first language, and scale score, explained a very modest 7%-9% of the variability in the Pass/Fail module completions in the reading data set, and 7.3%-10.3% of the variability in the Pass/Fail module completions in the numeracy data set; hence our view that richer data sets need to be generated to do justice to sector performance.

5. *CONCLUSIONS AND RECOMMENDATIONS*

5.1 **The LNAT data-extraction file layout limits users in the sector.** We recommend that

- a multivariate layout for the LNAT data-extraction files be adopted so that error-prone manual processes at user level can be avoided.
- naming conventions for assessment naming be used for more optimal search and sort functions in Excel.

5.2 **The time between start and progress assessments should be taken into account in calculating statistically significant gain**. Although LN development is often referred to as "spiky", long-term trends are usually upwards. We therefore recommend that TEC take into account our proposal, namely, to introduce a time-lapse variable based on calculating a proportion of gain to be achieved depending on the time between initial and progress assessments.

5.3 **Establish categories of module completion in the Student Data Return.** We recommend that TEC review how SDR data and LNAT data can be merged in tracking of LN performance against module completions.

5.4 **Support the sector to develop richer data sets to track student performance**. We recommend that TEC assist the sector to develop a comprehensive tracking system (Coolbear & associates, 2012), based on statistical modelling, as Lane (2014) anticipates, taking into account a richer set of relevant variables.

5.5 **Findings for Māori, Pasifika, New Zealand Pākeha support MoE analyses and TEC interventions**. Our findings showed that the strategic priorities in the Tertiary Education Strategy (2014-2019) (MoE, 2014), and the TEC's concerted effort to improve outcomes for Māori and Pasifika (TEC 2013, TEC 2014), as well as positions adopted in the TEC's LN implementation strategy (TEC, 2015), were justified.

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